LP11002 HBA

Installation Manual

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Introduction

The Emulex® LP11002 host bus adapter (HBA) is a dual-channel, 4-gigabit per second (Gb/s), Fibre Channel (FC) PCI-X 2.0 HBA. The core technology of this HBA is Emulex's seventh generation FC controller. The controller incorporates a multi-function native PCI-X 2.0 core that is compliant to the Peripheral Component Interconnect (PCI) and PCI-X local bus specifications. The HBA supports burst data transfers up to 266-megahertz MHz PCI-X Mode 2, 133 MHz PCI-X Mode 1, or 66 MHz PCI. The two independent, fully featured FC ports are compliant to various American National Standards Institute (ANSI) FC standards. The product is targeted at FC storage networking environments that require the highest degrees of robustness, performance and ease of management.

Major Features

- Multi-function PCI-X device with two fully independent FC ports
- Auto-negotiation between 1-Gb, 2-Gb or 4-Gb link attachments
- High performance FC HBA with the PCI-X 2.0 to FC controller with two internal processors
- Complies with the PCI-X 2.0a and PCI 3.0 specifications for 3.3-V add-in cards
- Full support for all FC topologies including point-to-point, arbitrated loop and fabric
- Full support for FC service class 2 and 3
- Maximum FC throughput achieved via full duplex hardware support
- End-to-end data path-parity and cyclical redundancy check (CRC) protection, including internal data path random-access memory (RAM)
- Architectural support for multiple upper layer protocols
- State-of-the-art circuitry:
    - All PCI-X and FC functionality contained within a single, custom, high-density, fully integrated FC controller
    - Internal ARM 1136J-S processors with instruction and data cache
    - Internal serializer deserializer (SerDes) 1-Gb/2-Gb/4-Gb cores
- Internal high-speed static RAM (SRAM)
- Error correcting code (ECC) protection of local memory, including single-bit correction and double-bit protection
- The LP11002 HBA provides an embedded short wave optical (LC) connections with link diagnostics capability.
- Host interface via Emulex standard drivers or through custom drivers written to the Emulex Service Level Interface (SLI-2) that is compatible with the many existing Emulex drivers for products such as LP8000, LP9002L, LP9802, LP10000 HBAs
- Comprehensive array of operating system (OS) drivers:
    - Emulex standard and OEM derivatives of device drivers for Windows 2000 Server, Windows Server 2003, Novell NetWare, Sun Solaris, Linux and HP-UX
    - OEM-specific drivers for AIX and some other operating systems
    - Some drivers support both SCSI and IP protocols
    - Support for remote and fabric boot functionality
- On-board context management by the firmware (per port):
    - Up to 510 FC port logins
    - Up to 1023 concurrent exchanges

    - I/O multiplexing down to the FC frame level
- Data buffers capable of supporting 16 buffer-to-buffer (BB) credits for short-wave applications
- Link management and recovery handled by the firmware
- On-board diagnostic capability accessible via optional connection
- Parts and construction compliant to the European Union Directive of Restriction of Hazardous Substances (RoHS)

Compatibility

Table 1. Software and Hardware Environments

Software Environments	Windows 2000 Server, Windows Server 2003, Novell NetWare, Sun Solaris, Linux and HP-UX
Hardware Environments	PCI and PCI-X Mode 1 and 2 compliant systems

Prerequisites

- PCI 32/64-bit data and 33/66-MHz clock frequency, 3.3-V signaling
- PCI-X Mode 1 64-bit data and 66/100/133-MHz clock frequency
- PCI-X Mode 2 64-bit data and 266-MHz (133-MHz clock frequency, double data rate)
- 3.3-V and 5-V PCI power required for operation

Setting the Jumpers

Caution: Emulex LightPulse® HBAs contain electronic components that can be damaged by static electricity through an electrostatic discharge (ESD) event. To prevent ESD damage, maintain constant contact with any grounded metal surface. A grounding wrist strap is useful for this purpose. Handle the card carefully at all times and preferably by the edges. Avoid touching electronic components and keep the card in the original packaging until you are ready for installation.

The device ID jumpers are used in custom applications. Do not change the jumper settings for a standard Emulex installation.

The host adapter has two six-post jumper blocks, one jumper block for each port, that control the host adapter's device ID. The ID is selected by installing a jumper between posts 1 and 2, or 3 and 4, or 5 and 6. If no jumper is installed, the host bus adapter reports a device ID of 1AE5 for each channel. Port 0 is the top transceiver, and port 1 is the bottom transceiver.

Table 2: Jumper Settings (Port 0 and Port 1)

PCI Identifier	P0_JX (Port 0)	P1_JX (Port 1)
FD00	1–2	1–2
FD01	3–4	3–4
1AE5*****	5–6	5–6

Note: * Without a jumper, the HBA reports a device ID of 1AE5. Most software drivers require a PCI device ID of FD00 to properly identify and control the HBA. Do not attempt to operate the HBA with the PCI device ID set to 1AE5 unless recommended by the driver installation instructions.

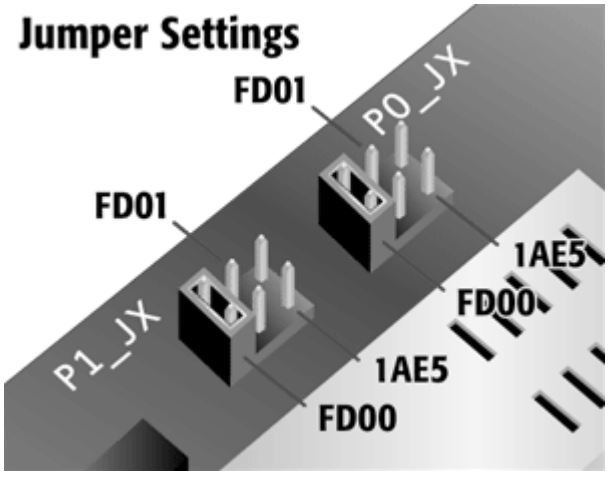


Figure 1: The LP11002 HBA Jumper Settings

Installing the Host Bus Adapter

To install the HBA:

1. Each HBA is shipped with a unique 64-bit identifier called the IEEE address. The FC industry uses a World Wide Name (WWN) derived from the IEEE address, and this number is needed for FC connectivity. Since this adapter has two ports, there are two IEEE addresses. The IEEE address is used when configuring your system. The serial number is used when communicating with Emulex. All numbers are clearly marked on the board. We recommend that you record these numbers before installation.
2. Turn off and unplug the computer.
3. Remove the computer case.

   Note: For best I/O performance, place the adapter into an empty PCI-X slot that is running at 133 MHz. Ensure that the PCI bus is not shared with another PCI card that can lower the PCI slot clock rate.

4. Remove the blank panel from an empty PCI or PCI-X bus slot. Follow steps 5–8 to change the bracket if they are different sizes. Otherwise, skip to step 9.

   Note: The HBA comes with a standard PCI bracket installed. A low-profile bracket is included in the box with the HBA. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 in. (7.9 cm) compared to 4.75 in. (12.06 cm) long.

5. Remove the mounting bracket screws from the top of the HBA.

Figure 2: Removing the Bracket

6. Remove the bracket and store it for future use.
7. Align the new mounting bracket tabs with the holes in the HBA.

   Note: Be careful not to push the bracket past the transceiver housing's grounding tabs. Make sure the light emitting diodes (LEDs) are properly aligned with the holes in the bracket.

8. Replace the screws that attach the HBA to the bracket.
9. Insert the HBA into the empty 32- or 64-bit PCI or PCI-X bus slot. Press firmly until the adapter is seated.
10. Secure the HBA's mounting bracket to the case with the panel screw or clip.
11. Replace the computer case and tighten case screws.

    The HBA is now installed in the PC and is ready for media attachment.

Attaching Media

Note: The HBA will not allow normal data transmission on an optical link unless it is connected to another similar or compatible laser product (that is, multimode to multimode.)

Use multimode fiber optic cable, with short-wave lasers, that adheres to the following specifications:

Table 3: Media Specifications

Fiber Optic Cable	Maximum Length	Minimum Length	Connector
62.5/125 µm (multimode) 200 MHz*km bandwidth cable	300 meters at 1.0625 Gb/s 150 meters at 2.125 Gb/s 70 meters at 4.25 Gb/s	.5 meters	LC
50/125 µm (multimode) 500 MHz*km bandwidth cable	500 meters at 1.0625 Gb/s 300 meters at 2.125 Gb/s 150 meters at 4.25 Gb/s	.5 meters	LC

To attach media to the HBA:

1. Connect the fiber optic cable to the LC connectors on the HBA.

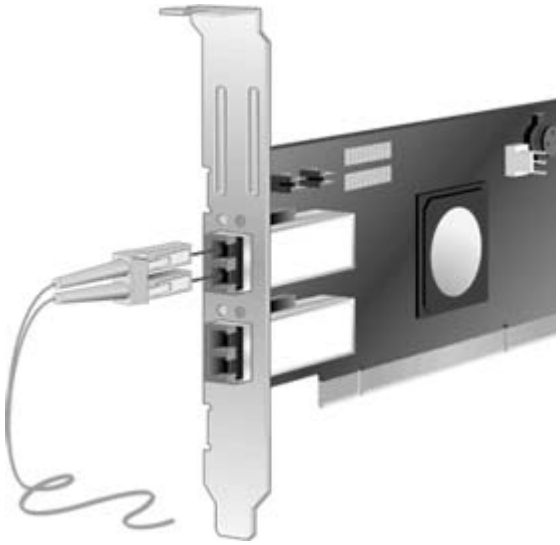


Figure 3: Connecting Fiber Optic Cable

2. Connect the other end of the cable to the Fibre Channel device.

After the media is connected to the HBA, you are ready to apply power to the computer.

Applying Power

To apply power:

1. Verify that the HBA is securely installed in the computer.
2. Verify that the correct media is attached.
3. Plug in and turn on the computer.
4. Observe LEDs for Power On Self Test (POST) results.

Viewing the LEDs

Green and yellow LEDs can be seen through openings in the HBA's mounting bracket. Green indicates firmware operation and yellow signifies port activity. Each port has a corresponding set of green and yellow LEDs.

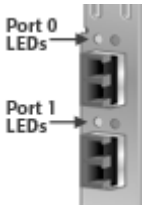


Figure 4: LEDs

POST Conditions and Results

POST conditions and results are summarized in the following table:

Table 4: POST Conditions and Results

Yellow LED	Green LED	State
Off	Off	Wake-up failure (Dead board)
On	Off	POST failure (Dead board)
Slow Blink	Off	Wake-up failure monitor
Fast Blink	Off	POST failure
Flashing	Off	POST processing in progress
Off	On	Failure while functioning
On	On	Failure while functioning
1 Blink	On	1Gb Link rate -Normal, link up
2 Blinks	On	2Gb Link rate -Normal, link up
3 Blinks	On	4Gb Link rate -Normal, link up
Off	Slow Blink	Normal -link down or not started
Slow Blink	Slow Blink	Off-line for download
Fast Blink	Slow Blink	Restricted off-line mode (Waiting for restart)
Flashing	Slow Blink	Restricted off-line mode (Test active)

References

Specifications

Table 5: LP11002 Specifications

Parameter	Range
Media Interface	The controller interfaces to the physical media through an FC-0 Media Interface (FC-PI compliant transceiver), and then connects through dual optical fiber LC connectors.
Physical Dimensions	Low-profile MD2 form factor, 6.600 inches by 2.536 inches, and accommodates both the full-height and low-profile bracket.
Power Requirements	In a PCI/PCI-X, Mode 1, 66-MHz host: • 1.5 watts (typical) @ +3.3 VDC • 3.7 watts (typical) @ +5.0 VDC • 5.6 watts (total typical) In a PCI-X, Mode 1, 100/133-MHz host: • 1.5 watts (typical) @ +3.3 VDC • 4.1 watts (typical) @ +5.0 VDC • 6.0 watts (total typical) In a PCI-X, Mode 2, 133-MHz host: • 1.5 watts (typical) @ +3.3 VDC • 4.3 watts (typical) @ +5.0 VDC • 6.5 watts (total typical)
Airflow	100 lf/min (minimum)
Temperature	32° to 113° F (0° to 45° C), Operating -40° to 158° F (-40° to 70° C), Storage
Humidity	5% to 95% non-condensing
Agency Approvals for LP11002	Class 1 Laser Product per DHHS 21CFR (J) & EN60825-1 UL recognized to UL60950-1:2003 CUR recognized to CSA 22.2, No. 60950-1-03 Baurt-certified by TUV to 60950-1 FCC Rules, Part 15, Class A Industry Canada, ICES-003, Class A EMC Directives 89/336/EEC and 2004/108/EC (CE Mark) EN55022, Class A EN55024 Australian EMC Framework (C-Tick Mark) AS/NZS CISPR22:2002 Class A Japan VCCI, Class A Taiwan BSMI, Class A Korea MIC, Class A

FCC and Regulatory Notices

LP11002 HBA Models

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

Paul Folino, Chief Executive Officer

Emulex Corporation (714) 662-5600

3333 Susan St. Costa Mesa, CA. 92626 USA

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The reader is cautioned that changes or modifications made to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment. The above statement applies to products marketed in the USA.

This class A digital apparatus meets all requirements of the Industry Canada (IC) Interference - Causing Equipment Standard (ICES-003).

Cet appareil numerique de la Classe A respecte toutes les exigences du reglement sur le materiel brouilleur du Canada. This statement applies to products marketed in Canada.

Notice for Japan and Translations (VCCI)

Product Label

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A

この装置は，クラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 **VCCI－Ａ**

Manual Notice

Translation:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

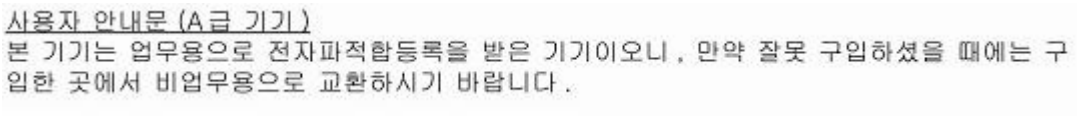
この装置は，情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Notice for Taiwan and Translations (BSMI)

Translation:

This equipment is a Class A ITE, and operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

Notice for South Korea and Translations (MIC)



Translation:

Class A Equipment: Please note that this equipment has been approved for business purposes with regards to electromagnetic interference. If purchased in error for use in a residential area, you may wish to exchange the equipment where you purchased it.

Declaration of Conformity

LP11002 HBA

This equipment complies with CISPR22/EN55022 Class A.

WARNING: This is a class A product. In a domestic environment, this product may cause radio interference requiring the user to take adequate measures.

Note: Changes or modifications not expressly approved by Emulex Corporation could void the user's authority to operate this equipment.

EMULEX
We network storage

DECLARATION OF CONFORMITY

Manufacturer: Emulex Design and Manufacturing Corporation
3333 Susan Street
Costa Mesa, California 92626 USA

declares under sole responsibility that the product:

Product Name:	LightPulse™ Fibre Channel Host Bus Adapter
Models:	LP11002-M4, LP11000-M4, LP1150-F4
Assembly Number:	FC1120003-XX (FC1110404-XX) *non-RoHS compliant*
	FC1120006-XX (FC1110407-XX) *RoHS compliant*

To which this Declaration relates is in conformity with the following standards or other documents for Information Technology Equipment (ITE):

Product Safety:
UL Recognized to UL 60950-1:2003, First Edition
CUR Recognized to CSA22.2, No. 60950-1-03
IEC 60950-1 (2001) [CB Scheme]
EN 60950-1 (2001) + A11
EN 60825-1 (1994) + A1 +A2
EN 60825-2 (1994)
CFR Title 21, Laser AEL Class 1, FDA/CDRH

EMC:
FCC Rules, CFR Title 47, Part 15, Subpart B, Class A
Industry Canada, ICES-003, Class A
EN55022 (1998) / CISPR 22 (1997) Class A, EN55024 (1998)
AZ/NZS CISPR22:2002, Class A
VCCI V-2 / V-3, Class A
CNS 13438 (1997) Class A, KN22 (2000) Class A, KN24

Supplementary Information:
1. The Product was tested in a typical configuration.
2. The product complies with the requirements of the following directives:
   - European Union Low Voltage Directive 73/23/EEC
   - European Union EMC Directives 89/336/EEC and 2004/108/EC
   - CE-Marking Directive 93/68/EEC (Carries the CE-Mark accordingly)
   - Australian EMC Framework (Carries the C-Tick mark accordingly)

June 13, 2005
Costa Mesa, CA.

Paul Folino, Chief Executive Officer

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Laser Safety Notice

This laser safety information contains certification and product information covering laser products known as optical small form factor transceivers incorporated in Emulex LightPulse host adapters. The small form factor transceiver is the primary cable connection mechanism for any optical port on the host adapter. This data is not intended to be a replacement for any safety regulations and standards; relevant safety documents should always be consulted if necessary. Contact Emulex Corporation with any questions or concerns about laser safety.

Certification and Classification

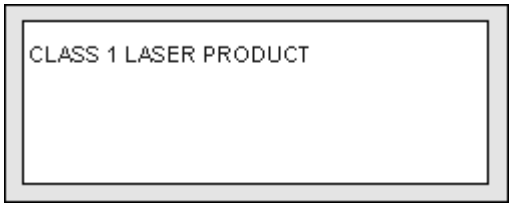
The LP11000, LP11002 and LP1150 host adapters may contain a laser product known as a small form factor transceiver. This transceiver provides the physical connection to the optical cable, and its LC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's appropriate PCI/PCI-X expansion slot.

In the United States, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated by a label located on the optical small form factor transceiver.

In Europe, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser component assemblies that conform to the requirements contained in the CENELEC (European Committee for Electrotechnical Standardization) standard EN60825-1:1994 (including amendment 11) and EN60825-2:1994. Small form factor transceivers are certified by a recognized European testing agency and have appropriate markings on the assembly. The DHHS conformity label and European conformity mark will not be visible externally once the optical small form factor transceiver is connected to or inserted in the host adapter and the adapter is installed into a system.

Labeling Requirements

No caution or danger labels are required for use of the small form factor transceiver since they are Class 1 laser component assembly. In the U.S., the only laser safety label required is the DHHS certification label that already appears on the small form factor transceiver. In Europe, the EN60825-1/EN60825-2 standards require that the system-level product has a Class 1 information label permanently attached and clearly visible whenever access to the GLM, GBIC, 1x9 and small form factor transceiver optical port is possible. Each Class 1 product shall have affixed an explanatory label bearing the words:



Alternatively, at the discretion of the manufacturer, the same statement may be included in user information. If a label is used, an example of the IEC Class 1 information label that is suitable for most European countries is shown below. The label consists of black printing on a white background. Languages represented on this label are English, German, Finnish and French, and they represent the minimum set for acceptance of a Class 1 product in most European countries.

Product Information

Small Form Factor Transceiver

The small form factor transceiver is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each small form factor transceiver consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave length small form factor transceivers and 1270 to 1355 nanometers for long wavelength small form factor transceivers. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the small form factor transceiver.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and could possible lead to points of access that may emit laser radiation levels above the Class 1 limits established in the U. S. by the DHHS and within Europe by EN60825-1/EN60825-2.

Short wavelength and long wavelength small form factor transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength small form factor transceivers embedded in Emulex host adapter are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Any system level product that incorporates the small form factor transceivers must provide power supply protection that guarantees a voltage of 5.0 volts or less at the small form factor transceivers. The functional power supply range of the small form factor transceivers product is specified as 3.135 to 3.465V typically. Operation outside of this range may degrade the performance and lifetime of the transceiver. The transceiver will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 5.0 volts. If the power supply level rises above 5.0 volts, the small form factor transceiver cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

System Level Certification

All host adapters containing embedded small form factor transceivers are certified as Class 1 laser products within the U.S. and Class 1 laser component assemblies outside of the U.S. Manufacturers of products properly incorporating the small form factor transceiver do not need to recertify their product for laser safety. The procedure for full system certification is therefore identical to that used for any other electronic system. When applying for system level certification to electronic standards such as IEC950, the regulatory engineers may want to see the DHHS and European conformity labeling on the small form

factor transceiver, and the system level documentation and labeling. Copies of the certificate of conformity for any small form factor transceiver sold by Emulex can be obtained upon request from Emulex Corporation, Costa Mesa.